

JAPANESE

[JP,2002-158447,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM  
MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

\* NOTICES \*

**JPO and INPIT are not responsible for any damages caused by the use of this translation.**

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the multilayer interconnection board obtained by electrical link between layers, manufacturing method of the multilayer interconnection board which performs adhesion simultaneously, and a method for the same.

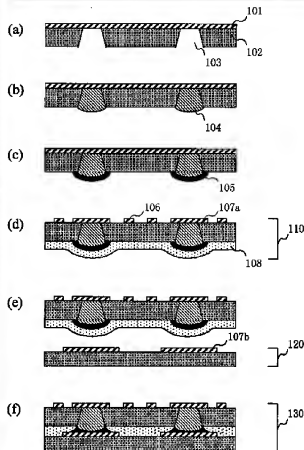
[0002]

[Description of the Prior Art]Also compared with the former, a miniaturization and multi pin-ization are following increasingly high-density integration of electronic parts, and the semiconductor package which high-density-assembly-ization is progressing further and is used for these electronic equipment with the demand of advanced features of electronic equipment in recent years, and small-and-light-izing.

[0003]. The conventional circuit board is called a printed wired board, and consist of a laminate sheet which impregnated the textile fabrics of glass fiber with the epoxy resin. After patterning the copper foil stuck on the glass epoxy board, use of the wiring board which piled up two or more sheets, carried out lamination adhesion, made the through hole with the drill, performed copper plating on the wall surface of this hole, formed beer and performed electrical connection between layers was in use. However, the miniaturization of a mounted part and densification progress, in the above-mentioned wiring board, wiring density is insufficient and a problem arises increasingly in loading of parts.

[0004]The build up multilayer interconnection board is adopted by such background in recent years. A build up multilayer interconnection

Drawing selection Representative draw



[Translation done.]

board is fabricated accumulating the insulating layer which comprises only resin, and a conductor. As a beer formation method, instead of the conventional drilling, it is various, and the laser method, a plasma process, the photograph method, etc. are arranging the beer hall of a byway freely, and attain densification. As an interlayer connection part, there are bride beer (Blind Via), volleyed beer (Buried Via: structure which filled up beer with the conductor), etc., and the volleyed beer hall in which the stacked beer which forms beer on beer is possible attracts attention especially. As a volleyed beer hall, the method of filling up a beer hall with plating, and when filling up with conductive paste etc., it is divided. On the other hand, methods of forming a circuit pattern include the method (subtractive process) of etching copper foil, the method (additive process) by electrolytic copper plating, etc., and especially the additive process that can respond to the densification of wiring density is beginning to attract attention.

[0005]The conductive wiring pattern formed in the surface of a mold-release characteristic support plate is transferred on the surface of the adhesive insulator which embedded the conductor in JP,H10-84186,A at the hole provided in the position corresponding to the pattern of the wiring layer. In order to indicate the wiring board which makes Bahia connection and to fill up the inside of beer with a conductor (conductive paste) at the same time it forms a wiring layer in the surface of said adhesive insulator (volleyed beer), In order the stacked beer which forms beer on beer is possible and also to form a circuit pattern with electrolysis plating etc. (additive process), a detailed circuit pattern can be formed and it is supposed that densification will be possible.

However, since conductive paste is performing the electrical link between layers, this method is not enough as reliability. The advanced art which embeds conductive paste from detailed beer and the circuit pattern formed in the surface of a mold-release characteristic support plate, It is difficult for the advanced art which carries out alignment lamination of the beer formed in the adhesive insulator and another circuit pattern simultaneously to be also needed, and to deal with the further minuteness making.

[0006]The insulation layer which has the beer filled up with JP,H11-251703,A with the conductive composition, Have the circuit pattern formed on the conductive buffer layer formed on the field of one side of an electric conduction constituent, or both, and the conductive buffer layer, and a conductive buffer layer, The circuit boards which form the alloy or the intermetallic compound are indicated to be either one of a conductive composition or a circuit pattern, and both. This method aims at the improvement in connection reliability of conductive paste and a circuit pattern. However, in this method, unless the surface of the conductive buffer layer which forms an intermetallic compound, the conductive composition, and the circuit pattern is fully defecated, a conductive buffer layer cannot get wet, and it cannot spread, but a soldered joint becomes insufficient, and a reliable electrical link is not obtained.

[0007]Although Au-Sn alloy was used for the electrode surface for connection and the electrical link is tried in the art indicated by document "development of the multilayer interconnection board by the

package lamination method of a tape shape film" (Institute of Electronics Packaging, vol.1, No.2 (1998)), Since Au-Sn alloy is damp and does not spread on the whole surface, between Au-Sn, it becomes the partial junction which sandwiched thermosetting adhesive, and reliability is not enough. Although the hardening layer of thermosetting adhesive is provided with epoxy adhesive, here, Although it is a bisphenol A type or a cresolnovolak type as an epoxy resin and is specifically with phenol novolak resin as a hardening agent, the function is only layer indirect arrival and there is no description about removal of the oxide film of a surface of metal and the defecation function of the surface of metal of reduction.

[0008]Although the method of being 300 ° or less in temperature, and making electric connection as an electrode for connection using alloys which use Sn as the main ingredients, such as Sn-Pb solder, is indicated by JP,H11-204939,A, joining by solder is impossible if a joinable surface is not defecated. On the other hand, since a circuit pattern is a subtractive process which forms copper foil by etching, it is difficult to deal with the minuteness making of the further circuit pattern.

[0009]In JP,H8-195560,A, the insulation layer which has a conductor circuit layer, and the insulation layer which does not have a conductor circuit layer on both sides or one side predetermined number pile \*\*\*\*\* , Simultaneously in [ pressurize and fabricate and ] the manufacturing method of the predetermined printed circuit board to which the conductor circuit layer of two upper and lower sides is electrically connected at least, Each insulation layer is formed by the sheet shaped insulator resin layer which does not contain glass fiber. On the given place of a conductor circuit layer, the projection (regulus) which consists of a conductor for the electrical links between conductor circuit layers is provided, A layered product is pressed using a press jig board, and the manufacturing method made to contact and stick by pressure is indicated in the conductor circuit layer which a projection breaks through an insulator resin layer and counters with pressing pressure. The solder layer which has melting temperature higher than the resin curing temperature of an insulator resin layer in the tip part of a projection is provided, After going up temperature to the melting temperature of solder this state, carrying out melting of the solder layer, after breaking through the insulator resin layer by the projection by heat and a pressure and connecting a solder layer to a conductor circuit layer, and connecting a projection to a conductor circuit layer, the manufacturing method which cools and solidifies a solder layer is indicated. Since the projection (regulus) which consists of conductors performs an interlayer connection according to this manufacturing method, the stacked beer which forms beer (projection) on beer (projection) becomes possible, and densification of an interlayer connection part can be attained. Since it is not necessary to form beer in an insulator resin layer, there is also an advantage which can be manufactured with simple and sufficient quality. However, in the method of the above-mentioned former, an electrical link is only physical contact and it is expected that it is unreliable. Since solder cannot be damp and the surface of the solder layer at the tip of a conductor and a conductor circuit layer cannot spread in the latter

method unless defecation, i.e., removal and reduction of a surface oxide film, is fully carried out, joining by solder is impossible.

[0010]In the manufacturing method of the multilayer interconnection board which laminates a conductor layer and an insulating layer by turns, and forms the conductor wire of a multilayer interconnection board on a substrate in JP,S62-222696,A, The process of forming the substrate metal layer patterned after the field which forms said conductor wire desired wiring pattern shapes and the shape of approximately isomorphism, The manufacturing method which consists of a process of forming an insulating layer at least in addition to said substrate metal layer, and a process of performing nonelectrolytic plating and forming said conductor wire on said substrate metal layer by making said insulating layer into plating resist is indicated. The greatest feature of this invention is in the place which forms a circuit pattern with nonelectrolytic plating, and since it not only can form a conductor wire by uniform thickness by this, but it is an additive process, it can form a detailed conductor wire. However, in order to take time to form a conductor wire in desired thickness for the conductor wire formation by nonelectrolytic plating, serious SUBJECT that improvement in productivity cannot be aimed at occurs. Although a substrate metal layer is patterned desired wiring pattern shapes and the shape of approximately isomorphism, Since it is necessary to make the size (width) of a substrate metal layer larger than wiring pattern shapes in order for a crevice to be made not to be formed between an insulating layer and a conductor wire, the space of an adjoining conductor wire cannot be narrowed but serious SUBJECT that an obstacle arises in improvement in circuit density also occurs.

[0011]Generally, for a soldered joint, dirt, such as an oxide of a surface of metal of the electrode which faces the solder surface, is removed, and reoxidation of the surface of metal at the time of a soldered joint is prevented, the surface tension of solder is reduced, and the flux for soldering which melting solder makes it easy to get wet is used for a surface of metal. The flux which added the active agent etc. which remove and return an oxide film to thermoplastics system flux, such as rosin, as this flux is used. However, if this flux remains, thermoplastics will fuse at an elevated temperature and the time of humid, and problems, such as a fall of electric insulation, such as also separating the active ion in an active agent, and corrosion of printed wiring, will arise. Therefore, washing removal of the remaining flux after a soldered joint must be carried out now. Therefore, for the soldered joint of the multilayer printed board, the circuit board, and the multilayered circuit board which were indicated by above-mentioned JP,H8-195560,A, JP, H11-251703,A, and JP,H11-204939,A, Even if it uses such flux for soldering, insulation reliability cannot be acquired although a soldered joint can be done certainly.

[0012]

[Problem(s) to be Solved by the Invention]An object in view of the problem of such the actual condition of an interlayer connection in the multilayer interconnection board carrying a semiconductor chip of this invention is to be able to carry out an interlayer connection certainly and to provide a reliable multilayer interconnection board.

[0013]

[Means for Solving the Problem] Namely, a connection body which has a land for interlayer connections of a circuit pattern in which this invention has a land for interlayer connections, and a circuit pattern, A land which a conductor post is formed on one of lands, and a solder layer is formed in a tip surface of a conductor post, or the surface of a land which faces at least, and faces a conductor post via an adhesives layer, It is a multilayer interconnection board which has the interlayer connection part joined with solder through a process of adhesion, application of pressure, and heating, Before passing through a process of adhesion, application of pressure, and heating, that this solder layer is heat-treated on the basis of a multilayer interconnection board by which it is characterized heat treatment of a solder layer, It is preferred to carry out in a vacuum or an inert atmosphere, it is preferred to heat-treat at temperature more than the melting point of solder used for a solder layer, or it is much more preferred to heat-treat, after applying resin which has a flux or surface cleaning-ized function on the surface of a solder layer. It is preferred that it is performed after heat treatment of a solder layer forms an adhesives layer which consists of adhesives which have a surface cleaning-ized function on the surface of a solder layer.

[0014] In this invention, as for a conductor post, it is preferred to consist of copper formed by electrolysis plating, and, as for a solder layer, being formed by electrolysis plating is preferred.

[0015] As for adhesives used for an adhesives layer in this invention, it is preferred to have a surface cleaning-ized function, Or resin (A) which has at least one or more phenolic hydroxyl groups as 1st desirable adhesives, Resin (B) which acts as the hardening agent is used by what is used as an essential ingredient, and it further, Resin (A) which it has a phenolic hydroxyl group Phenol novolak resin, It is preferred that it is at least one sort chosen from alkylphenol novolak resin, resole resin, and polyvinyl phenol resin, and it is preferred that resin (A) which has a phenolic hydroxyl group is contained in adhesives at less than more than 20wt%~80wt%. What uses as an essential ingredient a compound (D) which has an epoxy resin (C) and an imidazole ring, and acts as a hardening agent of an epoxy resin (C) as 2nd desirable adhesives is used, It is preferred that a compound (D) which acts as a hardening agent is contained in adhesives at less than more than 1wt%~10wt%.

[0016] This invention is a multilayer interconnection board characterized by being obtained with a manufacturing method of said multilayer interconnection board.

[0017]

[Embodiment of the Invention] Hereafter, although the embodiment of this invention is described with reference to Drawings, this invention is not limited at all by this. Drawing 1 is a figure for explaining the 1st example of the manufacturing method of the multilayer interconnection board which is an embodiment of this invention, and drawing 1 (f) is a sectional view showing the structure of the multilayer interconnection board obtained.

[0018] As a manufacturing method of the multilayer interconnection board of this invention, the two-layer structure which consists of the

metallic foil 101 and the insulator layer 102 is prepared first, and the beer 103 is formed in the insulator layer 102 ([drawing 1 \(a\)](#)). A two-layer structure can be obtained by applying resin varnish directly by methods, such as printing, a curtain coat, and a bar coat, on the metallic foil 101. A two-layer structure like commercial copper foil with resin (for example, copper foil with polyimide) may be prepared. The two-layer structure can also obtain it by the ability to carry out overall etching of one copper foil of glass epoxy double-sided copper clad laminate.

[0019]If the formation method of the beer 103 is a method of being suitable for this manufacturing method, what kind of method may be used and laser, the dry etching by plasma, chemical etching, etc. will be mentioned. As laser, carbon dioxide laser, ultraviolet laser, an excimer laser, etc. can be used. When the insulator layer 102 contains a reinforcing fiber like glass epoxy, it is preferred to use the carbon dioxide laser which can penetrate resin and glass fabrics and can form the beer 103. When the insulator layer 102 does not contain reinforcing fibers, such as polyimide, it is preferred to use the ultraviolet laser which can form the more detailed beer 103. When the insulator layer 102 is used as a photopolymer, the beer 103 can also be formed in exposing the insulator layer 102 selectively and developing it.

[0020]Next, the conductor post 104 is formed with electrolysis plating by considering the metallic foil 101 as the lead for electrolysis plating (electrode for electric supply) ([drawing 1 \(b\)](#)). The conductor post 104 is formed in the portion in which the beer 103 of the insulator layer 102 is formed by this electrolysis plating. If the conductor post 104 is formed with electrolysis plating, the shape at the tip of the conductor post 104 is freely controllable. As construction material of the conductor post 104, if suitable for this manufacturing method, what kind of thing may be used, for example, copper, nickel, gold, tin, silver, palladium, etc. will be mentioned. The conductor post 104 stable in low resistance is obtained by using copper.

[0021]Next, the solder layer 105 is formed in the surface (tip) of the conductor post 104 ([drawing 1 \(c\)](#)). As a formation method of the solder layer 105, the method of forming with nonelectrolytic plating, the method of forming with electrolysis plating by considering the metallic foil 101 as the lead for electrolysis plating (electrode for electric supply), and the method of printing the paste containing solder are mentioned. Although it is necessary to the conductor post 104 to align the mask for printing with sufficient accuracy in the method by printing, in the method by nonelectrolytic plating or electrolysis plating, since the solder layer 105 is not formed other than the surface of the conductor post 104, it is easy to respond also to the minuteness making and densification of the conductor post 104. Since the metal which can be especially plated with the method by electrolysis plating rather than the method by nonelectrolytic plating is easy also for management of a drug solution variously, it is dramatically suitable. It is preferred to use the solder which consists of at least two sorts of Sn, In or Sn, Ag, Cu, Zn, Bi, Pd, Sb, Pb, In, and Au as construction material of the solder layer 105. It is more desirable environment-friendly Pb free solder. Although [drawing 1 \(c\)](#) showed the example which forms

the solder layer 105 in the surface of the conductor post 104, since the purpose of forming the solder layer 105 is to join with solder the conductor post 104 and the land 107b of the connection body 120, it may form the solder layer 105 in the land 107b. Of course, the solder layer 105 may be formed in both the surfaces of the conductor post 104 and the land 107b.

[0022]Next, it heat-treats to the solder layer 105 (not shown). The solder layer 105 obtained by electrolysis plating or nonelectrolytic plating comes to function as solder by each metal which constitutes solder having only deposited as a crystal, and performing suitable heat treatment. In order to prevent oxidation on the surface of solder by heat treatment as heat treatment performed to the solder layer 105, it is preferred to heat-treat in a vacuum or inert atmospheres (for example, nitrogen etc.). Since the oxide film and dirt on the surface of solder are removable by heat-treating after applying to the surface of the solder layer 105 the resin which has a flux or surface cleaning-ized function, it is much more desirable. As a temperature of heat treatment, it is preferred that it is the temperature more than the melting point of solder. When the insulator layer 102 consists of resin, it is preferred to heat-treat at the temperature of 400 °C or less. In the temperature over 400 °C, it is because it stops achieving the function as the insulator layer 102 by the pyrolysis of resin, etc. As resin which has a surface cleaning-ized function, the same constituent as the adhesives which have a surface cleaning-ized function can be used.

[0023]It is more desirable when it heat-treats, after forming the adhesives layer 108 which consists of adhesives which have a surface cleaning-ized function instead of the process of applying to the surface of said solder layer 105 the resin which has a flux or surface cleaning-ized function. The adhesives which have this surface cleaning-ized function after heat treatment can be used as it is as an adhesives layer. Although the details about the adhesives which have a surface cleaning-ized function are as below-mentioned, If the resin which has a this flux and surface cleaning-ized function remains when heat-treating by applying the resin which has a flux or surface cleaning-ized function, Thermoplastics fuses at an elevated temperature and the time of humid, and there is a possibility that problems, such as a fall of electric insulation, such as also separating the active ion in an active agent, and corrosion of printed wiring, may arise. Since there is a possibility of causing poor molding and the adhesive agent of the connection body 110 and the connection body 120 in formation of the adhesives layer 108 of a subsequent process, it is necessary to wash and remove the resin which has a this flux and surface cleaning-ized function.

[0024]Next, by etching the metallic foil 101 selectively, the circuit pattern 106 which has the land 107a is formed, and the adhesives layer 108 is formed in the surface of the insulator layer 102 (drawing 1 (d)). Thereby, the connection body 110 can be obtained. When the adhesives layer which consists of adhesive resin which already has a surface cleaning-ized function on the surface of a solder layer is formed, it is not necessary to form an adhesives layer on the surface of an insulator layer. The method for which it was suitable according to the resin to be used may be used for formation of the adhesives layer 108, and the

method of applying resin varnish directly by methods, such as printing, a curtain coat, and a bar coat, or laminating dry film type resin by methods, such as a vacuum lamination and a vacuum press, is mentioned. Although the function of the adhesives layer 108 is as below-mentioned in detail, they are two functions of a metaled surface cleaning-ized function and an adhesion function. The former is a function required in order to realize a soldered joint, the latter is a function required in order to paste up the connection body 110 and the connection body 120, and both cannot lack it. Although [drawing 1 \(d\)](#) showed the example which forms the adhesives layer 108 in the surface of the insulator layer 102, the adhesives layer 108 may be formed in the surface of the connection body 120. Of course, you may form in both the surfaces of the insulator layer 102 and the connection body 120.

[0025]Next, alignment of the connection body 110 and the connection body 120 is carried out ([drawing 1 \(e\)](#)). The method of carrying out read position doubling of the positioning mark currently beforehand formed in the connection body 110 and the connection body 120 with an image recognition device, the method of carrying out alignment by the pin for alignment, etc., etc. can be used for alignment.

[0026]Finally, the connection body 110 and the connection body 120 are laminated ([drawing 1 \(f\)](#)). It pressurizes until the conductor post 104 eliminates the adhesives layer 108 and joins by solder to the land 107b by the solder layer 105, using a vacuum press for example as a laminating method, and also it can heat, the adhesives layer 108 can be stiffened, and the connection body 110 and the connection body 120 can be pasted up.

[0027]The multilayer interconnection board 130 on which the land 107b and the conductor post 104 were joined by solder by the solder layer 105, and between each class was pasted up in the adhesives layer 108 by the above process can be obtained. Although [drawing 1 \(f\)](#) showed the example which accepted one layer of connection bodies 110, and laminated them to the connection body 120, it can laminate one more layer or more than two-layer further on the multilayer interconnection board 130 obtained by [drawing 1 \(f\)](#), and a multilayer interconnection board with more number of layerses can also be obtained.

[0028][Drawing 2](#) is a figure for explaining the 2nd example of the manufacturing method of the multilayer interconnection board which is an embodiment of this invention, and [drawing 2 \(f\)](#) is a sectional view showing the structure of the multilayer interconnection board obtained.

[0029]That the 2nd example of the manufacturing method of the multilayer interconnection board of this invention differs from the 1st example, Etch the metallic foil 101 selectively, and the metal plate 201 is considered as the lead for electrolysis plating (electrode for electric supply) instead of forming the circuit pattern 106 which has the land 107a. It is a point which forms the circuit pattern 206 which has the land 207a with electrolysis plating, and the fundamental manufacturing method is almost the same. Hereafter, only a different portion from the 1st example is explained to details about the 2nd example.

[0030]First, plating resist (not shown) patterned on the metal plate 201



is formed, then by considering the metal plate 201 as the lead for electrolysis plating (electrode for electric supply), plating resist is removed, after forming the circuit pattern 206 which has the land 207a with electrolysis plating ([drawing 2 \(a\)](#)). The circuit pattern 206 which has the land 207a with this electrolysis plating into the portion in which plating resist on the metal plate 201 is not formed is formed. As construction material of the circuit pattern 206 which has the land 207a, copper, nickel, gold, tin, silver, palladium, etc. are mentioned, for example. The circuit pattern 206 which has the land 207a stable in low resistance by using copper is obtained. As long as the construction material of the metal plate 201 is suitable for this manufacturing method, what kind of thing may be sufficient as it, but it needs to have tolerance to the drug solution used especially, and to be able to remove by etching eventually. As construction material of such a metal plate 201, copper, a copper alloy, 42 alloys, nickel, etc. are mentioned, for example. On the other hand, on the metal plate 201, plating resist laminates a UV photosensitivity dry film resist, exposes it selectively using a negative film etc., and can be formed by developing negatives after that, for example.

[0031]Next, the insulator layer 202 is formed on the circuit pattern 206 which has the land 207a, then the beer 203 is formed in the insulator layer 202 ([drawing 2 \(b\)](#)). Anythings can be used for it if the resin which constitutes the insulator layer 202 fits this manufacturing method. The method for which it was suitable according to the resin to be used may be used for formation of the insulator layer 202, and the method of applying resin varnish directly by methods, such as printing, a curtain coat, and a bar coat, or laminating dry film type resin by methods, such as a vacuum lamination and a vacuum press, is mentioned. If it fabricates especially the copper foil with resin marketed being easy to receive, and embedding unevenness of the circuit pattern 206 which has the land 207a by vacuum lamination and copper foil is finally etched, It becomes very flat, without the surface of the insulator layer 202 being influenced by unevenness of the circuit pattern 206 which has the land 207a. Since the detailed roughening shape of a copper foil surface is transferred by the surface of the insulator layer 202, adhesion with the adhesives layer 208 shown in [drawing 2 \(d\)](#) is securable. On the other hand, the formation method of the beer 203 is the same as that of the 1st example.

[0032]Next, the conductor post 204 is formed with electrolysis plating by considering the metal plate 201 as the lead for electrolysis plating (electrode for electric supply), then the solder layer 205 is formed in the surface (tip) of the conductor post 204 ([drawing 2 \(c\)](#)). The formation method of the conductor post 204 and the solder layer 205 is the same as that of the 1st example.

[0033]Next, it heat-treats to the solder layer 205 (not shown). About heat treatment of the solder layer 205, it is the same as that of the 1st example.

[0034]Next, the adhesives layer 208 is formed in the surface of the insulator layer 202 ([drawing 2 \(d\)](#)). The formation method of the adhesives layer 208 is the same as that of the 1st example.

[0035]Next, alignment is carried out for the connection body 210 and

the connection body 220 ([drawing 2 \(e\)](#)). The alignment method is the same as that of the 1st example.

[0036] Finally, the connection body 210 and the connection body 220 are laminated, and etching removes the metal plate 201 ([drawing 2 \(f\)](#)). The laminating method is the same as that of the 1st example. What is necessary is just to etch the metal plate 201 using the drug solution which does not erode and corrode the circuit pattern 206 which has the land 207a, when the construction material of the circuit pattern 206 which has the metal plate 201 and the land 207a differs. When the construction material of the metal plate 201 and the circuit pattern 206 which has the land 207a is the same, Since the circuit pattern 206 which has the land 207a is eroded and corroded when etching the metal plate 201, When etching the metal plate 201 between the metal plate 201 and the circuit pattern 206 which has the land 207a, the resist metal layer (not shown) which has tolerance to the drug solution to be used is beforehand formed in it. Thereby, even if it etches the metal plate 201, since there is a resist metal layer, erode the circuit pattern 206 which has the land 207a, and it is not corroded. Then, etching removes a resist metal layer using the drug solution which does not erode and corrode the circuit pattern 206 which has the land 207a (of course, it may not remove but may leave).

[0037] If it explains concretely, the construction material of the metal plate 201 can etch the metal plate 201 using a commercial ammonia system etching reagent, when the construction material of copper and a resist metal layer is nickel, tin, or solder. The construction material of the metal plate 201 can etch the metal plate 201 using almost all etching reagents including a ferric chloride solution and a cupric chloride solution, when the construction material of copper and resist metal is gold. The construction material of the circuit pattern 206 which has the land 207a can etch a resist metal layer using commercial solder and nickel remover (for example, the Mitsubishi Gas Chemical make, Pewtax), when the construction material of copper and a resist metal layer is nickel, tin, or solder. The construction material of copper and a resist metal layer has the construction material of the circuit pattern 206 which has the land 207a difficult for etching a resist metal layer, without making the circuit pattern 206 which has the land 207a when it is gold corrode and corrode. In this case, may not remove a resist metal layer and it may leave it.

[0038] The multilayer interconnection board 230 on which the land 207b and the conductor post 204 were joined by solder by the solder layer 205, and between each class was pasted up in the adhesives layer 208 by the above process can be obtained. Although [drawing 2 \(f\)](#) showed the example which accepted one layer of connection bodies 210, and laminated them to the connection body 220, it can laminate one more layer or more than two-layer further on the multilayer interconnection board 230 obtained by [drawing 2 \(f\)](#), and a multilayer interconnection board with more number of layerses can also be obtained.

[0039] The adhesives layer used for this invention has a surface cleaning-ized function, and there is the feature in the place which is adhesives with high insulation reliability most. As a surface cleaning-

ized function, they are a removing function of the oxide film which exists in the solder surface or the connection metal surface, and a reduction function of an oxide film, for example. With the surface cleaning-ized function of this adhesives layer, wettability with the surface for connecting with solder fully increases. Therefore, in order for an adhesives layer to defecate a surface of metal, it always needs to be in contact with the surface for connecting with solder. The power in which solder is damp and tries to spread to a joinable surface by defecating both the surfaces works, the solder is damp and the adhesives layer in a soldered joint is eliminated by the power of a spread. From this, it is hard to generate resin remaining in the soldered joint using an adhesives layer, and the electrical connection reliability becomes it with a high thing.

[0040]The resin (A) in which the 1st desirable adhesives used for this invention have at least one or more phenolic hydroxyl groups, The resin (B) which acts as the hardening agent is used as the essential ingredient, and with the surface cleaning-ized function, the phenolic hydroxyl group of the resin (A) which has a phenolic hydroxyl group returns removal or the oxide of dirt, such as solder and an oxide of a surface of metal, and acts as flux of a soldered joint. With the resin (B) which acts as the hardening agent, since a good hardened material can be obtained, the washing removal after a soldered joint is unnecessary, electric insulation is held also by an elevated temperature and a humid atmosphere, and the soldered joint with high bonding strength and reliability is enabled.

[0041]As resin (A) which has at least one or more phenolic hydroxyl groups used for the 1st desirable adhesives in this invention, It is preferred to be chosen out of phenol novolak resin, alkylphenol novolak resin, resole resin, and polyvinyl phenol resin, and it can use these one or more sorts.

[0042]An epoxy resin, isocyanate resin, etc. are used as resin (B) which acts as a hardening agent of the resin (A) which has the 1st desirable adhesives phenolic hydroxyl group in this invention. Each specifically A bisphenol system, a phenol novolac system, The epoxy compound and isocyanate compound which denaturalized considering skeletons, such as a thing of phenol bases, such as an alkylphenol novolac system, a biphenol system, a naphthol series, and a resorcinol system, aliphatic series and annular aliphatic series, and unsaturation aliphatic series, as a base are mentioned.

[0043]As for the resin (A) which is used for the 1st desirable adhesives in this invention and which has a phenolic hydroxyl group, it is preferred to be contained at less than more than 20wt%80wt% in adhesives. There is a possibility that it may become impossible for the operation which defecates a surface of metal as it is less than 20 % of the weight to fall and join by solder, and when more than 80 % of the weight, enough hardened materials are not obtained but there is a possibility that bonding strength and reliability may fall. As loadings of the resin (B) which acts as a hardening agent, 0.5 or more times of the phenolic hydroxyl equivalent of a compound (A) or the carboxyl group equivalent and 1.5 or less times have the epoxy group equivalent or the preferred IANETO group equivalent. There is a possibility that enough

hardened materials may not be obtained as it is less than 0.5 time, but reliability may fall. When more than 1.5 times, there is a possibility that the operation which removes dirt, such as solder and an oxide of a surface of metal, may fall, and the reliability of a soldered joint may fall. A curing catalyst, a coloring agent, an inorganic filler, various kinds of coupling agents, etc. may be added to the resin used for an adhesives layer.

[0044]The 2nd desirable adhesives used for this invention the compound (D) which has an epoxy resin (C) and an imidazole ring, and acts as a hardening agent of an epoxy resin (C). It is considered as the essential ingredient, and with the surface cleaning-ized function resulting from the unpaired electron of the third class amine, the imidazole ring of a compound (D) returns removal or the oxide film of dirt, such as solder and an oxide of a surface of metal, and acts as flux of a soldered joint. Since an imidazole ring acts also as a hardening agent at the time of carrying out anionic polymerization of the epoxy resin (C), it can obtain a good hardened material, its washing removal after a soldered joint is unnecessary, it holds electric insulation also by an elevated temperature and a humid atmosphere, and enables the soldered joint with high bonding strength and reliability.

[0045]As for the addition of the compound (D) used for the 2nd desirable adhesives in this invention, it is preferred that it is less than more than 1wt% 10wt%. There is a possibility that it may become impossible for a surface cleaning-ized function to become weak less than [ 1wt% ], and for the addition of a compound (D) to fully stiffen an epoxy resin (C). When there are more additions of a compound (D) more than 10wt%, a hardening reaction advances rapidly, the mobility of the adhesives layer at the time of a soldered joint falls, and there is a possibility of checking a soldered joint. The hardened material obtained becomes weak and there is a possibility that the soldered joint of sufficient intensity may no longer be obtained. The addition of a compound (D) is less than more than 1wt% 5wt% more preferably.

[0046]As an epoxy resin (C) used combining the compound (D) used with the 2nd desirable adhesives in this invention, A bisphenol system, a phenol novolac system, an alkylphenol novolac system, The epoxy compound which denaturalized considering skeletons, such as epoxy resins of a phenol base, such as a biphenol system, a naphthol series, and a resorcinol system, aliphatic series and annular aliphatic series, and unsaturation aliphatic series, as a base is mentioned.

[0047]As a compound (D) used with the 2nd desirable adhesives in this invention, Imidazole, 2-methylimidazole, 2-ethyl-4-methylimidazole, 2-phenylimidazole, 1-benzyl-2-methylimidazole, 2-undecylimidazole, 2-phenyl-4-methylimidazole, A screw (2-ethyl-4-methyl-imidazole), 2-phenyl-4-methyl-5-hydroxymethylimidazole, The 2-phenyl- 4, 5-dihydroxymethylimidazole, 1-cyanoethyl-2-ethyl-4-methylimidazole, 1-cyanoethyl-2-methylimidazole, 1-cyanoethyl-2-phenylimidazole, or triazine addition type imidazole is mentioned. What adduct[ epoxy ]-ized these, and the thing which \*\*\*\*\*ed can also be used. These may be used alone or may use two or more kinds together.

[0048]30 - 99wt% of the adhesives of the loadings of the epoxy resin (C) used with the 2nd desirable adhesives in this invention are

preferred. There is a possibility that enough hardened materials may no longer be obtained as it is less than [ 30wt% ]. Thermosetting resin and thermoplastics, such as cyanate resin, acrylic acid resin, methacrylate resin, and maleimide resin, may be blended with the resin used for an adhesives layer. A curing catalyst, a coloring agent, an inorganic filler, various kinds of coupling agents, etc. may be added to the resin used for an adhesives layer.

[0049]

[Example] Hereafter, although working example explains still more concretely, this invention is not limited at all by this.

[0050] [Adjustment of an adhesives varnish] 1 m of examples of adjustment, and 100 g of p-cresol novolak resin (PAS-1, the Nippon Kayaku Co., Ltd. make, OH equivalent 120), 140 g of bisphenol F type epoxy resin (RE-404S, the Nippon Kayaku Co., Ltd. make, EP equivalent 165) was dissolved in 60 g of cyclohexanone, 0.2 g of triphenylphosphine (made by Hokko Chemical Industry Co., Ltd.) was added as a curing catalyst, and the adhesives varnish 1 was produced.

[0051] an example of adjustment 2 dicyclopentadiene-skeleton content epoxy resin (XD-1000L.) The Nippon Kayaku make and weight per epoxy equivalent 245 245g were dissolved in 105 g of cyclohexanone, 5g of 2-phenyl-4-methyl-5-hydroxymethylimidazole (2P4 MHZ-PW, made in Shikoku Chemicals) was added, and the adhesives varnish 2 was produced.

[0052] the substrate for flexible printed wiring (the Sumitomo Bakelite make.) which consists of <manufacture of multilayer interconnection board> copper foil (the metallic foil 101 and 18 micrometers in thickness), and a polyimide resin insulator layer (the insulator layer 102 and 25 micrometers in thickness) UV-YAG laser was used for the polyimide resin insulator layer of A1 FUREKI, and the beer (beer 103) whose top diameter: 45 micrometer and diameter of a bottom product are 25 micrometers was formed. After defecating the inside of beer, and a beer periphery with a permanganic acid resin etching solution, electrolytic copper plating was performed by having considered copper foil on the back as the lead for electrolysis plating (electrode for electric supply), beer was filled up with copper, and the copper post (conductor post 104) was formed. Here, the time of electrolytic copper plating was adjusted so that the diameter of a copper post might be set to 45 micrometers. Next, the Sn-Pb eutectic solder layer (solder layer) was formed by a thickness of 2.5 micrometers with electrolysis plating on the surface of the copper post. Next, copper foil was etched selectively and the circuit pattern (circuit pattern 106) which has a land for interlayer connections (land 107a) was formed.

[0053] Twelve samples of samples which passed through the above-mentioned process were created, and two every samples each of heat treatment \*\*\*\*\* samples were produced on the conditions shown in working example 1 - working example 6, and the comparative example of Table 1.

[0054]

[Table 1]

表1

	熱処理	雰囲気	温度	時間	フラックス <sup>*1</sup>
実施例1	有	空気	240℃	30秒	使用 <sup>*2</sup>
実施例2	有	空気	240℃	30秒	接着剤1
実施例3	有	空気	240℃	30秒	接着剤2
実施例4	有	空気	240℃	30秒	—
実施例5	有	窒素	240℃	30秒	—
実施例6	有	真空	240℃	30秒	—
比較例	無	—	—	—	—

\*1:MSP511(九州松下電器製) \*2:熱処理後、イソプロピルアルコールにて洗浄

[0055]Next, to ten obtained samples about working example 1, working example 4 - working example 6, and a comparative example with a bar coat. The above-mentioned adhesives varnish 1 was dried at 80 \*\* for 20 minutes after applying to the field in which it was formed, the surface, i.e., the Sn-Pb eutectic solder layer, of the insulator layer, and the adhesives layer (adhesives layer 108) of 10-micrometer thickness was formed. The connection body (connection body 110) was able to be obtained by the old process. About working example 2, the adhesives layer 108 was formed on the solder layer with the adhesives varnish 1 before heat treatment, about working example 3, before heat treatment, the adhesives layer 108 was formed on the solder layer, and commercial flux was applied [ comparative example ] to the solder layer surface with the adhesives varnish 2.

[0056]the glass epoxy double-sided copper clad laminate (the Sumitomo Bakelite make.) equivalent to FR-5 by which 12-micrometer copper foil in thickness was formed in both sides on the other hand Using ELC, copper foil was able to be etched selectively, the land (land 107b) for a circuit pattern (not shown) and interlayer connections was able to be formed, and the connection body (connection body 120) was able to be obtained. The land for interlayer connections was made into the diameter of 300 micrometer in consideration of the alignment permissible error.

[0057]Next, the positioning mark currently beforehand formed in the connection body obtained by the above-mentioned process and the connection body was read with the image recognition device, alignment of both was carried out, and temporary sticking by pressure was carried out at the temperature of 100 \*\*. Heat pressing of this was carried out at the temperature of 220 \*\* with a press, the copper post penetrated the adhesives layer, and joined by solder to the land, and the connection body and the connection body were pasted up by the adhesives layer.

[0058]By the above process, two every samples each of heat treatment \*\*\*\*\* multilayer interconnection boards shown in working example 1 - working example 6, and a comparative example were able to be obtained.

[0059]In order to observe the soldered joint of the multilayer interconnection board <observation of a soldered joint> Obtained, both

were torn off by the interface of the connection body and the connection body, i.e., an adhesives layer, and the solder wettability of the land (land 107b) of a connection body was evaluated. it can set to each sample which performed heat treatment shown in working example 1 - working example 6, and a comparative example -- it tears off and the surface photograph of a next land is shown in drawing 3. [0060]About the sample which performed heat treatment shown in working example 1 - working example 6 from drawing 3 to the solder layer, it turns out that the solder layer got wet good and has spread to a land. About the sample which, on the other hand, omits heat treatment shown in a comparative example, it turns out that near the center did not join by solder but copper of a land is exposed. It is clear that it is effective to heat-treat from this to a solder layer.

[0061]

[Effect of the Invention]By this invention, an interlayer connection can be carried out certainly and a reliable multilayer interconnection board can be provided.

---

[Translation done.]